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## (54) Moulding compositions containing a polyamide

(57) A moulding composition contains a polyamide, eg nylon 6 or nylon 66, and, optionally, a filler, such as magnesium hydroxide which acts as a flame-retardant. In order to reduce surface defects in the moulding, the composition also contains a surface defect-reducing agent selected from polyethylene glycol, polypropylene glycol, a polyethylene glycol-polypropylene glycol copolymer, and blends of these materials.

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## MOULDING COMPOSITIONS CONTAINING A POLYAMIDE

This invention is concerned with moulding compositions which contain a polyamide, e.g. nylon 6 or nylon 66, and is especially concerned with such compositions which contain a filler, eg magnesium hydroxide as a flame retardant.

Polyamides, such as nylons, are widely used for moulding components and, for some moulding applications are mixed with a flame-retardant so that the moulded component exhibits flame retardant characteristics. Such applications include electrical lamp-holders, and switch housings.

Magnesium hydroxide is a flame retardant which has been suggested for use with nylon. This material, when subjected to a flame, decomposes endothermically with the liberation of water. Nylon containing magnesium hydroxide has, however, been found to be difficult to mould because of its high melt viscosity and, furthermore, it is found that the mouldings have obvious surface defects which render them unacceptable commercially. Such surface defects manifest themselves by the appearance of white patches on the surface of the moulding. Various attempts have been made to overcome this problem but without achieving complete success. It is known to attempt to avoid the formation of surface defects by the addition of organic sulphonamide, eg butyl benzene sulphonamide (BBSA), to the moulding composition (see GB 2,237,573A) but even this has not achieved total success. Furthermore, mouldings containing BBSA are not flexible enough to be reliably used in mouldings which are to be snap-fit.

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It is an object of the present invention to provide a moulding composition containing a polyamide which produces mouldings which are substantially free of surface defects of the type referred to.

It is a further object of the invention to provide a moulding composition containing a polyamide and magnesium hydroxide which produces mouldings which are substantially free of surface defects of the type referred to.

The invention provides a moulding composition containing a polyamide wherein the composition also contains a surface defect-reducing agent selected from polyethylene glycol, polypropylene glycol, a polyethylene glycol-polypropylene glycol copolymer, and blends of these materials.

A moulding composition according to the invention is found to produce mouldings with reduced surface defects. The composition is also found to be easier to mould making it possible to mould compositions with higher concentrations of fillers. The use of polyethylene glycol (PEG) and/or polypropylene glycol (PUG) also has the following advantages in comparison with the use of BBSA:

- 1) PEG and PUG are cheaper;
- 2) PEG and PUG have a low order of toxicity;
- 3) Combustion of PEG and PUG cannot cause the formation of noxious oxides of sulphur and nitrogen;
- 4) burn times are improved in magnesium hydroxide-containing compositions; and
- 5) the moulding process requires less injection pressure.

The surface defect-reducing agent may provide 1 to 10 per cent or 2 to 5 per cent by weight of the composition, eg 2.5 or 3 per cent. This results in substantially no discernable surface defects.

The polyamide may be nylon 6, nylon 66, nylon 6.12, nylon 6.10 or another suitable polyamide. The polyamide may also be a co-polymer of two forms of nylon, eg nylon 6 and nylon 66.

The composition may also comprise a filler, eg flame-retardant such as magnesium hydroxide which may be present in 45 to 65 per cent by weight of the composition, or if a lower standard of flame-retardancy is acceptable, the percentage may be 20 to 45. The composition may contain additional fillers, for example, a ferromagnetic material such as strontium ferrite. The composition may also contain reinforcing fibres, e.g. glass fibres, which may be present in up to 35% by weight depending on the amount of magnesium hydroxide or other filler which is present. A plasticiser may also be used.

There now follow detailed descriptions of two moulding compositions which are illustrative of the invention.

The first illustrative moulding composition was a formulation of 28 parts nylon 6, 43.7 parts magnesium hydroxide (Magnifin H5), 0.3 parts calcium stearate (as a mould lubricant), 3 parts PEG, and 25 parts glass fibre (all parts by weight). The composition was injection moulded into test discs which were subjected to tests in comparison with a comparison composition of the same formulation but with the PEG replaced by BBSA.

The discs made from the comparison composition had noticeable surface defects in the form of white marks covering the surface. It was considered that mouldings made from the comparison composition would have been unsaleable as their appearance would have been unacceptable to a customer. The discs moulded from the first illustrative composition had substantially no surface defects. It was considered that mouldings made from the

first illustrative composition would have been acceptable to customers.

In a flammability test (ul94 second burn time test), the discs made from the comparison composition gave a mean burn time of 23.4 seconds whereas the discs made from the first illustrative composition had a greatly improved mean burn time of 7.6 seconds.

The second illustrative moulding composition was a formulation of 33 parts nylon 6, 41 parts magnesium hydroxide (Magnifin H5), 0.3 parts calcium stearate (as a mould lubricant), 2.5 parts PEG, and 25 parts glass fibre (all parts by weight). The composition was injection moulded into test discs which were subjected to tests in comparison with a comparison composition of the same formulation but with the PEG replaced by BBSA.

During the injection moulding, with the extruder torque at 60-65%, it was found that the extruder feed rate (kg/hour) was 14.5 for the comparison composition and 16 for the second illustrative composition. At 50% injection speed, the pressure required for complete mould fill (expressed in bar) was 113 for the comparison composition and 99 for the second illustrative composition. These figures clearly demonstrate the greater mouldability of the second illustrative composition.

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## CLAIMS

- 1 A moulding composition containing a polyamide wherein the composition also contains a surface defect-reducing agent selected from polyethylene glycol, polypropylene glycol, a polyethylene glycol-polypropylene glycol copolymer, and blends of these materials.
- 2 A moulding composition according to Claim 1, wherein the surface defect-reducing agent comprises 1 to 10 per cent by weight of the composition.
- 3 A moulding composition according to claim 1, wherein the surface defect-reducing agent comprises 2 to 5 per cent by weight of the composition.
- 4 A moulding composition according to any one of claims 1 to 3, wherein the polyamide is nylon 6.
- 5 A moulding composition according to any one of claims 1 to 3, wherein the polyamide is nylon 66.
- 6 A moulding composition according to any one of Claims 1 to 5, wherein the composition also comprises a filler.
- 7 A moulding composition according to claim 6, wherein filler is magnesium hydroxide.
- 8 A moulding composition according to any one of claims 1 to 7, wherein the composition also comprises reinforcing fibres.

- 9 A moulding composition substantially as hereinbefore described with reference to the first illustrative composition or the second illustrative composition.
- 10 A component moulded from a moulding composition according to any one of claims 1 to 9.



**Application No:** GB 9510353.7  
**Claims searched:** 1 to 10

**Examiner:** Miss M. M. Kelman  
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**Patents Act 1977**  
**Search Report under Section 17**

**Databases searched:**

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

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Other: ONLINE:PATENTS

**Documents considered to be relevant:**

Category	Identity of document and relevant passage	Relevant to claims
X	EP 0433000 A2 UBE INDUSTRIES see claims 1 to 8,10 12 and page 2, line 26 to page 3, line 8	1,2,4,5,6, 7,8,10
X	EP 0047529 A2 E.I.DU PONT see pages 2 to 4 and Examples 1 to 3	1,2,3,5,10
X	WO 94/03544 A1 BAXTER INTERNATIONAL see Examples 8 and 9	1,2,3,5,10
X	WPI Abstract Accession No:93-131418/16 & JP 5070662A(DAICEL) 23.03.93 see abstract	1,2,3,10 at least
X	WPI Abstract Accession No:77-06819Y/04 & JP 51144453A(ASAHI) 11.12.76 see abstract	1,2,10 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.